

1 Claims:

2 What is claimed is:

3 Claim ~~1~~

4 A system for embedding additional information in compressed  
5 audio data comprising:

6 (1) means for extracting MDCT coefficients from said  
7 compressed audio data;

8 (2) means for employing said MDCT coefficients to calculate  
9 a frequency component for said compressed audio data;

10 (3) means for embedding additional information in said  
11 frequency component obtained in a frequency domain;

12 (4) means for transforming into MDCT coefficients said  
13 frequency component in which said additional information is  
14 embedded; and

15 (5) means for using said MDCT coefficients, in which said  
16 additional information is embedded, to generate compressed  
17 audio data.

18 Claim ~~2~~

19 A system for updating additional information embedded in

1 compressed audio data comprising:

2 (1) means for extracting MDCT coefficients from said  
3 compressed audio data;

4 (2) means for employing said MDCT coefficients to calculate  
5 a frequency component for said compressed audio data;

6 (3) means for detecting said additional information in said  
7 frequency component that is obtained;

8 (3-1) means for changing, as needed, said additional  
9 information for said frequency component;

10 (4) means for transforming into MDCT coefficients said  
11 frequency component in which said additional information is  
12 embedded; and

13 (5) means for using said MDCT coefficients, in which said  
14 additional information is embedded, to generate compressed  
15 audio data.

16 Claim 3

17 A system for detecting additional information embedded in  
18 compressed audio data comprising:

19 (1) means for extracting MDCT coefficients from said  
20 compressed audio data;

1 (2) means for employing said MDCT coefficients to calculate  
2 a frequency component for said compressed audio data; and

3 (3) means for detecting said additional information in said  
4 frequency component that is obtained.

5 Claim 4

6 The system according to claim 1, wherein said means (2)  
7 calculates said frequency component for said compressed  
8 audio data using a precomputed table in which a correlation  
9 between MDCT coefficients and frequency components is  
10 included.

11 Claim 5

12 The system according to claim 1, wherein said means (4)  
13 transforms said frequency component into said MDCT  
14 coefficients by using a precomputed table that includes a  
15 correlation between MDCT coefficients and frequency  
16 components.

17 Claim 6

18 The system according to claim 1, wherein said means (3) for  
19 embedding said additional information in said frequency  
20 domain divides an area for embedding one bit by the time  
21 domain, and calculates a signal level for each of the

1 individual obtained area segments, while embedding said  
2 additional information in said frequency domains in  
3 accordance with the lowest signal level available for each  
4 frequency.

5 Claim 7

6 For at least one window function and one window length  
7 employed for compressing audio data, a method for generating  
8 a table including a correlation between MDCT coefficients  
9 and frequency components comprising the steps of:

10 (1) generating a basis which is used for performing a  
11 Fourier transform for a waveform along a time axis;

12 (2) multiplying a window function by a corresponding  
13 waveform that is generated by using said basis;

14 (3) performing an MDCT process, for the result obtained by  
15 the multiplication of said window function, and calculating  
16 an MDCT coefficient; and

17 (4) correlating said basis and said MDCT coefficient.

18 Claim 8

19 The table generation method according to claim 7, wherein,  
20 at said step (2) for multiplying said corresponding window  
21 function, a periodicity of said basis is employed to prevent

1 generation of a redundant correlation between a frequency  
2 component and an MDCT coefficient.

3 Claim 9

4 The table generation method according to claim 7, wherein,  
5 at said step (2) for multiplying said corresponding window  
6 function, said basis is divided into several segments, and  
7 corresponding window functions are multiplied for several of  
8 said segments, so that a redundant correlation between a  
9 frequency component and an MDCT coefficient is not  
10 generated.

11 Claim 10

12 A method for embedding additional information in compressed  
13 audio data comprising the steps of:

14 (1) extracting MDCT coefficients from said compressed audio  
15 data;

16 (2) employing said MDCT coefficients to calculate a  
17 frequency component for said compressed audio data;

18 (3) embedding additional information in said frequency  
19 component obtained in a frequency domain;

20 (4) transforming into MDCT coefficients said frequency  
21 component in which said additional information is embedded;

1 and

2 (5) using said MDCT coefficients, in which said additional  
3 information is embedded, to generate compressed audio data.

4 Claim 11

5 A method for updating additional information embedded in  
6 compressed audio data comprising the steps of:

7 (1) extracting MDCT coefficients from said compressed audio  
8 data;

9 (2) employing said MDCT coefficients to calculate a  
10 frequency component for said compressed audio data;

11 (3) detecting said additional information in said frequency  
12 component that is obtained;

13 (3-1) changing, as needed, said additional information for  
14 said frequency component;

15 (4) transforming into MDCT coefficients said frequency  
16 component in which said additional information is embedded;  
17 and

18 (5) using said MDCT coefficients, in which said additional  
19 information is embedded, to generate compressed audio data.

1 Claim 12

2 A method for detecting additional information embedded in  
3 compressed audio data comprising the step of:

4 (1) extracting MDCT coefficients from said compressed audio  
5 data;

6 (2) employing said MDCT coefficients to calculate a  
7 frequency component for said compressed audio data; and

8 (3) detecting said additional information in said frequency  
9 component that is obtained.

10 Claim 13

11 The method according to claim 10, wherein, at said step (2),  
12 said frequency component is calculated for said compressed  
13 audio data using a precomputed table in which a correlation  
14 between MDCT coefficients and frequency components is  
15 included.

16 Claim 14

17 The method according to claim 10, wherein, at said step (4),  
18 said frequency component is transformed into said MDCT  
19 coefficients by using a precomputed table that includes a  
20 correlation between MDCT coefficients and frequency  
21 components.

1 Claim 15

2 A computer-readable program storage medium on which a  
3 program is stored for executing the table generation method  
4 in accordance with claim 7.

5 Claim 16

6 A computer-readable program storage medium on which a  
7~ program is stored for executing the additional information  
8 embedding method according to claim 10.

9 Claim 17

10 A computer-readable program storage medium on which a  
11 program is stored for executing the additional information  
12 updating method according to claim 11.

13 Claim 18

14 A computer-readable program storage medium on which a  
15 program is stored for executing the additional information  
16 detection method according to claim 12.

17 Claim 18

18 An electronic watermarking apparatus comprising:

1           an information embedding device for embedding  
2 additional information in compressed audio data; and

3           a detection device for detecting said additional  
4 information from said compressed audio data,

5           said information embedding apparatus including,

6                 (1) means for extracting MDCT coefficients from  
7 said compressed audio data,

8                 (2) means for employing said MDCT coefficients to  
9 calculate a frequency component for said compressed audio  
10 data,

11                (3) means for embedding additional information in  
12 said frequency component obtained in a frequency domain,

13                (4) means for transforming into MDCT coefficients  
14 said frequency component in which said additional  
15 information is embedded, and

16                (5) means for using said MDCT coefficients, in  
17 which said additional information is embedded, to generate  
18 compressed audio data, and

19           said detection device including

20                 (1) means for extracting MDCT coefficients from

1 said compressed audio data,

2 (2) means for employing said MDCT coefficients to  
3 calculate a frequency component for said compressed audio  
4 data, and

5 (3) means for detecting said additional  
6 information in said frequency component that is obtained.